



## Influence of economic crisis on dietary quality and obesity rates

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Complete List of Authors:	Norte, Aurora; Universitat d'Alacant Facultat de Ciències de la Salut Sospedra, Isabel; Universitat d'Alacant Facultat de Ciències de la Salut, Ortiz-Moncada, Rocio; Universitat d'Alacant Facultat de Ciències de la Salut
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**Influence of economic crisis on dietary quality and obesity rates**

Aurora Norte<sup>a,b</sup>, Isabel Sospedra<sup>a,b\*</sup>, Rocío Ortíz-Moncada<sup>b,c</sup>

*<sup>a</sup>Nursing Department. Faculty of Health Science. University of Alicante, Alicante, Spain. <sup>b</sup>Research Group on Food and Nutrition (ALINUT). <sup>c</sup>Department of Community Nursing, Preventive Medicine, Public Health and History of Science. Faculty of Health Science. University of Alicante, Alicante, Spain.*

*\*Corresponding Author: Isabel Sospedra, Nursing Department. Faculty of Health Science. University of Alicante, Campus Sant Vicent del Raspeig, Ap. 99 E-03080, Alicante, Spain. Email: [isospedra@ua.es](mailto:isospedra@ua.es), Telephone: 0034 965902773. ORCID:0000-0002-8513-8986*

## Influence of economic crisis on dietary quality and obesity rates

The objective was to investigate how socio-economic changes have modified Body Mass Index values and dietary patterns in the Spanish population.

A comparative cross-sectional analysis of the last two iterations of the Spanish National Health Survey (SNSH) was done. The independent variables were sex, age, education level, employment situation, and social class. Outcome variables were: poor diet quality and obesity.

Economic crisis increases the probability to become obese and to have a poor diet and employment situation is the variable that showed the greatest differences between years. While in 2006 to be unemployed did not represent a risk to have a poor diet (OR: 0.74;  $P < 0,005$ ), in 2012 it did (OR: 1.27;  $P < 0,005$ ). Economic changes can modify diet quality and nutritional status, increasing the risk to have a poor diet or to be obese.

Keywords: Obesity; Diet quality; Economic crisis; Healthy Eating Index; National Health Survey.

### Introduction

Overweight and obesity are considered a growing health problem in many developed countries, including Spain. Sedentary lifestyles along with caloric-dense diets are some of the most common contributing factors (WHO 2013). The quality of the diet can also be affected by economic crisis. In times of crisis, limited social and economic resources can lead to disparities in access to healthy foods (Stuckler et al. 2009), and family support systems are more vulnerable when a great part of their incomes are allocated to buy food (Lo et al. 2009). Food market/trade policies, economic factors such as food prices, and the incomes of the consumers may be important determinants of food choices and consumption. A recent meta-analysis showed that healthier food-based diet patterns were more expensive than less healthy patterns, so low prices of high-energy products can generate not only an increase in total calorie intake, but also a shift toward

a diet with higher caloric density (Rao et al. 2013).

Although nearly all European countries were affected by the economic crisis that began in 2007, the consequences have not been the same for all of them, and Spain was one of the most affected countries. In the decade preceding 2007, the Spanish economy was among the fastest growing in Europe (World Bank 2011), but at the beginning of 2010, over 20% of working-age Spaniards were unemployed (EuroStat 2011). Several studies carried out by public health authorities have provided evidence that an economic recession on this scale leads to potential health consequences (WHO 2009).

In Spain, between the year 2006 (no crisis period) and the year 2012 (crisis period), economic and social situations have been modified; the government significantly cut the public health budget during the crisis period, and those budgets cuts had implications in food access and quality (Gallo and Gené-Badia 2013). The Spanish federation of food bank reported a significant increase in the quantity of food distributed among this period. The number of people demanding this service grew from 700000 to 1.5 million (Antentas and Vivas 2014).

Because of the economic changes that took place in those years, eating patterns could have changed and contributed to the rapid increase in the prevalence of overweight and obesity.

The objectives of this study were to estimate the prevalence of obesity and poor diet quality in Spain in 2006 and 2012 and to determine the association of socioeconomic characteristics with this prevalence. The main hypothesis was that the worsening of the financial conditions would lead to an increase of the probability to become obese, as well as affect the diet quality negatively.

## Materials and methods

The study was a cross-sectional, secondary data analysis that investigated the relationship between economic factors with diet quality and obesity rates. The data had been obtained from two cross-sectional surveys (one before the economic crisis, and the other after the beginning of the crisis) from the data collected by the Ministry of Health, Social Services, and Equality through the Spanish Health National Survey. Both surveys were conducted with representative samples of the non-institutionalized Spanish population.

For each edition of the SNHS the design of the questionnaire was revised but always with the basic criterion to maintain stability of the previously consolidated series. Between years 2006 and 2011 some changes were introduced, however, none of them are relevant for the present study.

Data from the Spanish National Health Survey of 2006/07 (SNHS 2007) and from the last Spanish National Health Survey of 2011/12 (SNHS 2012) is completely devoid of identifying information. The present study was deemed exempt by the University of Alicante Institutional Review Board.

The information collected by the survey was divided into three questionnaires; Household, adult questionnaire and minor questionnaires. Our study considered the population to fill out the Adult Questionnaire.

## *Study Population and Sample*

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In both surveys the target population was the set of persons who resided in main family dwellings. Samples was selected according to a stratified tri-stage sample, which guarantees the homogeneity of the samples.

The sample consisted of 28296 people who completed the SNHS 2006/07 and 20920 people who answered the last iteration of the SNHS carried out on 2011/12. Information was collected between June of 2006 and June of 2007 (SNHS 2006/07), and from July of 2011 to June of 2012 (SNHS 2011/12). Data were collected by personal interviews and all the information included was self-reported.  
~~; through personal interviews.~~

**Variables**

The variables used in this study were sex, age, education level, employment ~~situation~~ and social situation, social class, geographical location, Spanish Health Eating Index (SHEI) categories, and Body Mass Index (BMI) categories.

Outcome variables were poor diet quality and obesity.

To examine diet quality, the SHEI tool was used. SHEI is a measure of diet quality used to monitor changes in consumption patterns of the Spanish population (Norte and Ortiz-Moncada 2011). The SHEI questionnaire was developed to measure how well diets meet food-based dietary guidelines of the Spanish Society of Community Nutrition (SSCN 2014). The SHEI score for each individual is composed of 10 equally weighted components that represent food groups of the dietary guidelines. Each component has a minimum score of 0 and a maximum score of 10 (total range 0 to 100). The SHEI is composed of 10 variables: 1-cereals and derivatives, 2-vegetables, 3-fruits, 4-milk and derivatives, 5-meat, fish and eggs, 6-pulse, 7-sausages and cold meats, 8-sweets, 9-soft

drinks with sugar and 10-variety of the diet), built on the recommendations of the Healthy Eating Guide of the Spanish population (Spanish Society of Community Nutrition 2014). They are scored from 0 to 10 depending on the adequacy to the recommendation of frequency of consumption. Poor diet category obtained from the SHEI corresponds with the lowest scores. According to the SHEI, a score over 80 implies a “good” diet, a SHEI score between 51 and 80 implies a diet that “needs improvement,” and a SHEI score less than 51 corresponds to a “poor quality” diet.

Obesity is a BMI category defined as a value greater than or equal to 30 kg/m<sup>2</sup> (WHO 1995).

The explanatory variables included were education level, social class, geographical location and employment situation.

Education level refers to the level of schooling, and was categorized into three groups: no studies or primary studies, secondary studies, and university degree.

Geographical location variable was classified in three categories by grouping the Spanish Autonomous Regions according to their geographical location and economic similarities. North area comprises Aragon, Asturias, Cantabria, Galicia, Navarra, País Vasco and La Rioja. Central area is formed by Castilla La Mancha, Castilla Leon, Extremadura and Madrid. And finally, Mediterranean area is formed by Andalusia, Catalonia, Balearic Islands, Canary Islands, Valencian Community and the region of Murcia.

Employment situation was also classified into three groups: paid worker, unemployed, and homemakers. Paid workers include people with a stable employment or with regular incomes. Unemployed category includes workers without a stable employment, without regular incomes, and unemployed people. Homemaker category includes people who

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are engaged in housework in their own home, but who are not hired, or receive financial benefits.

The social class was based on the current or last occupation of the person, or of the head of the household for never employed respondents. Typically, groups compiled by SNHS are I-II: professionals, managers, directors; III: administrative workers, clerks and safety and security workers and self-employed; IV: skilled and semiskilled manual occupations; V: unskilled manual occupations. These groups were categorized in skilled non manual work (I-II-II categories) and unskilled manual work (IV-V categories).

**Statistical Analysis**

All analyses were performed with SPSS 22.0 for Windows.

The BMI and SHEI categories were described by sex, age, education level, employment situation, and social class for every year of survey.

In the second step of the analysis, the association between changes in socioeconomic conditions and health-related factors (obesity and poor diet), was analyzed by means of logistic regression. Crude odds ratio of obesity and poor eating in the year 2006 (before the economic crisis) relative to the year 2012 (during the crisis) were computed at 95% CI. In a first model Adjusted odds ratio by age and sex were also calculated, and in a second model the adjusted odds ratio by age, sex and SHEI was also calculated, both of them with 95% CI with 95% CI were also calculated.

**Results**



The characteristics of the samples in SNHS 2006/07 and 2011/12 pertaining to BMI categories and socioeconomic variables are shown in Table 1.

The study about the relation between BMI and the other variables shows a general increase in obesity rates in the year 2012 when compared to the year 2006.

When we examine BMI categories by sex, men have a higher prevalence of obesity than do women. The same result has been obtained for the overweight category. Results obtained regarding diet quality in both years also shows that men have a poorer diet than women.

Regarding the analysis by ages, in both, men and women, obesity and overweight is more frequent in older ages in the year 2012. However, in 2006 the percentage of adults that were overweight and obese decreased in people over 64 years old when compared to 45-64 year olds. Values of SHEI increase with age, showing a better diet quality for older people.

No significant differences between years were found when SHEI values are studied by geographical area. However, the Mediterranean area was the location that showed the highest percentage of people with a poorer diet in both years (around 4%).

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People with a low level of education, as well as people with unskilled manual jobs have a higher prevalence of obesity in both years, associated with a poor diet quality.

Homemakers and people without regular incomes show the highest percentages in overweight and obesity cases. The percentage of homemakers with a poor diet increases in 2012 when compared with 2006.

Results about the influence on socioeconomic factors on the probability to be obese are showed on Table 2. To quantify how much of the observed associations could be

attributed to the quality of the diet, this variable was added in the Model 2. Results obtained from the two models are similar for educational level and employment situation. However, for social class variable, when OR is also adjusted by SHEI, the probability to be obese decrease around 20%.

During the two periods covered by the survey, the odds of becoming obese decreased with high education levels (Table 2). There is a statistically significant increase when no studies, primary or secondary studies are compared to a higher education level.

Differences between years as well as among demographic categories within the same year were observed. Although, in the fully adjusted model of Social class, the odds of becoming obese increased significantly for unskilled manual workers in both years studied, the probability in 2012 was significantly higher than in 2006.

In 2006 people with unskilled manual works had 54.58% probability to become obese while, in 2012 this probability increased to 120.3%. These values between these years were also statistically significant (95%CI 2006:1.425-1.671; 95%CI 2012:2.1184-2.323), which evidence the difference between the two periods of time.

The effect of the employment situation was different for both years. In 2012, to be unemployed was a risk for obesity; however, in 2006 it was not.

To be a homemaker increased the probability of becoming obese by around 25% in both years when compared with paid workers.

Regarding SHEI results (Table 3), a lower level of education increases the risk to have a poor quality diet in both surveys. No significant differences between years 2006 and 2012 were found.

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6 In relation to social class the odds of having a poor diet increased in both years for  
7 unskilled manual workers, but were higher in 2012.  
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10 The employment situation is the variable that showed the greatest differences between  
11 years. While in 2006 to be unemployed or a homemaker did not represent a risk to have  
12 a poor diet, in 2012, it did. In fact, to be unemployed increases that risk by 27%.  
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## 19 **Discussion**

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21 This is the first study to investigate the relationship between economic factors and  
22 dietary quality or obesity rates in two different economic periods, before and during the  
23 economic crisis in Spain.  
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28 Results indicated that the crisis period influences the probability to become obese and to  
29 have a poor diet. These situations are also conditioned by several factors; among them  
30 are the variables related with work conditions that have mostly changed during the crisis  
31 years.  
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36 It is well known that economic crisis may affect health outcomes (Stuckler et al. 2009)  
37 and these economic factors may also be determinants of nutritional status (Lo et al.  
38 2009). Our study reflects the negative impact of the economic crisis on the nutritional  
39 status and consequently on health. The results obtained are in agreement with other  
40 studies about health risks of the economic crisis in Spain. Gili et al. (2013) found that  
41 recession contributes to weight gain, also influenced by the significantly increased  
42 frequency of mental health disorders and alcohol abuse. Rajmil et al. (2013) found high  
43 levels of overweight and obesity in children from unemployed families, which also  
44 increased during the crisis period. Despite differences in study design and statistical  
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methods of previous works and the present study, the results regarding the probability to be obese and its relation with socio-economic factors all point in the same direction.

According to our findings, while in 2006 to be unemployed did not suppose a risk to become obese, in 2012 this situation changed significantly. That fact acquires further significance taking into account the increasing number of unemployed individuals during the crisis period in Spain. A recent study described employment situation as one of the variables most related to economic crisis (Chung and Oorschot 2011).

The strong influence of socioeconomic factors on BMI is becomes evident when no substantial differences are observed between results taking into account the diet. Among all socio-economic factors studied, employment situation showed a clear association with the prevalence of overweight and obesity. The same relation has been found for these socio-economic variable and healthy eating habits. While in 2006 to be unemployed or a homemaker contributed to having a good quality diet, in 2012 this effect cannot be observed. Moreover, although in 2012 to be a homemaker did not have an effect on SHEI values; to be unemployed or not have stable work was negatively associated with diet quality, increasing the risk of a poor diet. Similar results were found in a recent study of the impact of socioeconomic crisis in Italy (Bonaccio et al. 2017). This relation can be explained by the fact that healthy diets cost more if healthy food costs more (Lo et al. 2009). Food diversity has been reported as an index of dietary quality and food security, thus a varied and balanced diet is a prerequisite for good health. Several studies about costs associated with eating a 'healthy' or 'unhealthy' diet concluded that diets high in fats and sweets represent a low-cost option to the consumer, whereas the recommended food diversity based on healthy food consumption costs more (Drewnowski et al. 2004; Drewnowski and Specter 2004).

The employment situation is not the only socio-economic variable that has been found to modify the quality of the diet. Other factors related with the employment situation, such as job insecurity, can contribute to these findings. Job insecurity has been described as a risk factor for obesity (Muenster et al. 2011), and consequently could be related with a poor quality of the diet.

In the period before economic crisis, temporary jobs were extremely prevalent. In 2006 there were many employment opportunities. The Spanish labor market had many job opportunities that were easily available for those made redundant. However, during the recession time, labor supply decreased notably. In particular, workers with temporary contracts suffered borne the brunt of the employment reduction. These people had difficulty in securing employment during the crisis years, and this job instability lead to insecurity about the future and financial means, and it supposes less investment of time, energy and money in healthy habits and behaviors (Winters et al. 2012). For the same reason, the proportion of expenditure spent on food by the citizens of Spain has fallen continuously over crisis years (Instituto Nacional de Estadística 2015). Our work reflects this situation of both the likelihood to have a poor diet and the risk to be obese.

Socioeconomic indicators have been found to be strongly associated with some eating patterns, as Mediterranean diet. (Bonaccio et al. (2014)) found a dramatic drop in adherence to Mediterranean diet during economic crisis and. This fact can also explain that the Mediterranean area of Spain is the location with the highest prevalence of of people with a poor diet found in the Mediterranean area of Spain.

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Individuals with a good employment situation as well as a high education or better social class, were more likely to have better opportunities for healthy eating, which resulted in a lower prevalence of obesity (Roos et al. 2008; Ovaskainen et al. 2010; Rosenthal et al. 2012).

Muenster et al. (2011) assessed the association between overweight, obesity and perceived job insecurity. They found that people with skilled manual jobs or unskilled jobs had the higher rates of overweight and obesity among all the job types analyzed. Our results are in agreement with these findings in both years studied. A study about socio-economic status, obesity, and lifestyle also concluded that subjects from lower socio-economic status had greater measures of obesity despite being more physically active at work (Brennan et al. 2010). To have an unskilled manual job is associated with the probability of becoming obese, and this fact is exacerbated by a poor financial situation, as is an economic crisis. This fact is supported by social class differences found in our results and by the significant difference obtained between the years 2006 and 2012. This gap has widened by economic crisis. At the same time, odds between SHEI and social class also shows a high risk to have a poor diet in the population with unskilled manual job, and this risk increased in 2012.

Although education level can influence other variables such as social class, a recent study about educational attainment and diet quality concluded that women of lower educational levels have less control over their lives than women with a higher education, and this lack of control is reflected in their diets, being of poorer quality (Barker et al. 2009).

According to previous studies (Rajmil L et al. 2013; García-Arenzana et al. 2012), the negative effects of the economic crisis appear to be mostly localized on those people with relatively less education of secondary school degree or less. These people, in general, were dependent on the manufacturing sector for employment, where the absolute number of manufacturing jobs has declined in crisis times. In addition, many of the new manufacturing jobs require skills that were not previously necessary (Gulledge and Haszko 1996).

Limited financial resources have been described as risk factors and those situations can be triggered by economic crisis as well as by natural disasters (Gaines et al. 2014). For this reason, federal, state, and local programs and policies developed all over the world to improve health security must, therefore, take into account the very real challenges of food security and nutritional problems occur when financial resources are limited.

Several limitations of our study should be considered. Data analyzed in the present work come from two surveys made with different samples. Although the questionnaire was the same, differences in the characteristics of the sample may have influenced the results. However, the high number of participants makes the data very consistent, and each survey is representative of the study population, which enables a comparison to be made.

According to the information provided by the Spanish National Health Survey, data about weight and height and consequently the BMI values, is self-reported data, which could lead to an understatement of the BMI values (Isidoro et al. 2011). This self-reported data may carry some bias but all the other variables analyzed were objective measures. Although data was self-reported, information was collect by a trained interviewer in a personal interview, which avoid other potential biases common in telephone surveys.

Another limitation is that variables used in this survey cannot allow to fully describe the occupational/economic status of the participants, as only education and type of occupation were collected and there is no information about their incomes. Furthermore, the unemployment group includes several situations, workers without a stable employment, without regular incomes, and unemployed workers. The estimated risks associated with unemployment could provide further information with a more in-depth

analysis.

Finally, the use of the SHEI to measure the quality of the diet entails the presence of the limitation inherent in the tool (Norte and Ortiz-Moncada 2011).

**Conclusion**

In conclusion, a significant increase in the risk to have a poor diet or to be obese during the crisis period has been found. These changes before and during the economic crisis are influenced by socio-economic variables that have also changed during the studied period.

In the light of our findings, food and nutrition practitioners can get involved in promoting and implementing effective policy measures to preserve and protect the health of the population, and to minimize the impacts of limited financial resources on the civilian population’s health. [Governments must take complementary measures, in order to ensure healthy food patterns. One of the key aspects is education. Programs and practices to educate population should be implemented since the first stages of school programs.](#)

**Disclosure statement**

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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Table 1. Distribution of the Body Mass Index for each socio-economic variable, 2006 and 2012 years.

BMI Categories 2006									BMI Categories 2012									
		Underweight		Normal weight		Overweight		Obesity		Underweight		Normal weight		Overweight		Obesity		
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	
<b>Sex</b>																		
Men		595	4.1	5284	36.7	6157	42.8	2357	16.4	128	1.3	3597	36.9	4305	44.2	1707	17.5	
Women		1747	11.7	6856	45.9	4002	26.8	2323	15.6	379	3.9	5111	52.8	2675	27.6	1521	15.7	
<b>Age</b>																		
16-24		396	10.8	2388	65.3	591	16.2	281	7.7	240	10.6	1580	69.6	346	15.3	104	4.6	
25-44		437	3.8	5899	50.6	3848	33.0	1464	12.6	168	2.2	3957	52.0	2536	33.3	947	12.4	
45-64		426	5.1	2604	31.2	3560	42.7	1747	21.0	66	1.1	2205	36.4	2490	41.1	1294	21.4	
> 64		1084	19.1	1250	22.0	2160	38.0	1188	20.9	34	1.0	966	27.7	1608	46.1	883	25.3	
<b>Education level</b>																		
No studies/primary		1809	11.4	5221	32.8	5767	36.3	3104	19.5	275	2.5	4287	39.7	4039	37.4	2186	20.3	
Secondary		344	4.2	4127	50.2	2688	32.7	1057	12.9	139	2.7	2442	48.4	1775	35.2	686	13.6	
University		171	3.5	2667	54.0	1619	32.8	481	9.7	74	2.7	1585	56.7	880	31.5	258	9.2	
<b>Social class</b>																		
Skilled non manual work		479	4.9	4410	44.8	3646	37.1	1301	13.2	189	2.7	3609	50.6	2468	34.6	862	12.1	
Unskilled manual work		1043	7.1	5804	39.7	5208	35.7	2547	17.4	299	2.5	4906	41.5	4357	36.9	2256	19.1	
<b>Employment situation</b>																		
Unemployed		1413	6.9	8084	39.5	7710	37.7	3267	16.0	265	2.3	5233	44.8	4275	36.6	1909	16.3	

Paid worker	364	8.4	2522	57.9	990	22.7	479	11.0	150	3.0	2441	48.6	1636	32.6	795	15.8
Homemakers	560	12.8	1504	34.3	1414	32.3	906	20.7	91	3.4	1025	38.1	1058	39.3	517	19.2

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Table 2. Crude and adjusted by age and gender (1) or by age, gender and SHEI (2) odds ratio for relation between Education level, Social class, Employment situation and obesity during years 2006 and 2012 in Spain.

2006									2012							
	Crude OR	95% CI	Adjusted OR (1)	95% CI	p	Adjusted OR (2)	95% CI	p	Crude OR	95% CI	Adjusted OR (1)	95% CI	p	Adjusted OR (2)	95% CI	p
<b>Education level</b>																
University	1		1			1			1		1					
Secondary	1.42	(1.26- 1.60)	1.60	(1.42-1.80)	< 0.001	1.61	(1.42-1.82)	< 0.001	1.73	(1.48- 2.02)	1.84	(1.57-2.16)	< 0.001	1.82	(1.55-2.14)	< 0.001
No studies/primary	3.30	(2.96- 3.67)	2.53	(2.27-2.83)	< 0.001	2.66	(2.37-2.98)	< 0.001	3.14	(2.72- 3.61)	2.73	(2.36-3.16)	< 0.001	2.81	(2.42-3.25)	< 0.001
<b>Social class</b>																
Skilled non manual work	1		1						1					1		
Unskilled manual work	1.49	(1.38- 1.61)	1.54	(1.42- 1.67)	< 0.001	1.58	(1.45- 1.71)	< 0.001	1.92	(1.76- 2.10)	2.22	(2.11- 2.33)	< 0.001	2.03	(1.84- 2.23)	< 0.001
<b>Employment situation</b>																
Paid worker	1		1						1		1			1		
Unemployed	0.47	(0.42-0.52)	0.89	(0.80-1.03)	0.057	0.97	(0.82-1.05)	0.232	0.89	(0.81- 0.98)	1.24	(1.12- 1.38)	< 0.001	1.20	(1.08- 1.33)	< 0.001
Homemakers	1.49	(1.36-1.63)	1.24	(1.13-1.36)	< 0.001	1.24	(1.36-1.63)	< 0.001	1.38	(1.23- 1.56)	1.27	(1.12- 1.44)	< 0.001	1.29	(1.14- 1.46)	< 0.001

Table 3: Crude and adjusted by age and gender odds ratio for relation between Education level, Social class, Employment situation and poor diet quality according to SHEI during years 2006 and 2012 in Spain.

	2006					2012				
	Crude OR	95% CI	Adjusted OR	95% CI	p	Crude OR	95% CI	Adjusted OR	95% CI	p
<b>Education level</b>										
University	1		1			1		1		
Secondary	2.36	(1.96 – 2.85)	1.79	(1.45- 2.22)	< 0.001	1.87	(1.39- 2.53)	1.96	(1.42-2.71)	< 0.001
No studies/primary	1.12	(0.94 – 1.33)	2.16	(1.76- 2.63)	0.227	1.72	(1.31- 2.27)	2.86	(2.12- 3.87)	< 0.001
<b>Social class</b>										
Skilled non manual work	1		1			1		1		
Unskilled manual work	1.66	(1.45-1.90)	1.54	(1.32-1.79)	< 0.001	1.67	(1.41-1.98)	1.81	(1.50-2.18)	< 0.001
<b>Employment situation</b>										
Paid worker	1		1			1		1		
Unemployed	3.24	(2.80 – 3.75)	0.74	(0.62 -0.90)	< 0.005	1.96	(1.65-2.32)	1.27	(1.05-1.55)	< 0.005
Homemakers	0.25	(0.19 – 0.31)	0.36	(0.28-0.47)	< 0.001	0.85	(0.67-1.07)	1.11	(0.85-1.45)	0.443